IT-Assisted Provision of Product Data to Online Retailers in the Home & Living Sector

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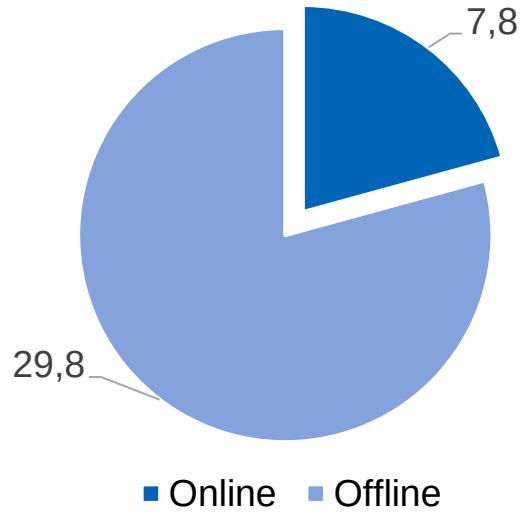
Motivation

Product data is a key component for selling products online

Total Revenue for Home & Living products in 2019 (in € bn) [1]



expected growth: 8.4% p.a.

[1] Wulff, Christian Dr.; Vocke, Reinhard; Arnoldy, Susanne; Ziechmann, Patrick; Schwertel, Stefan; Förster, Bernd (2019): Die deutsche Möbelbranche – Marktüberblick 2019 Available online at https://www.pwc.de/de/handel-und-konsumguter/die-deutsche-moebelbranche-marktueberblick-2019_neu.pdf, checked on 6/20/2021.

Outline


Motivation


Research Questions


State of the Art


Approaches towards Product Data Exchange


Proof-of-Concept for IT-Assisted Provision of Product Data


Evaluation of Proof-of-Concept


Conclusion, Limitations & Outlook

Research Questions

How do manufacturers in the Home & Living sector provide product data to online retailers?

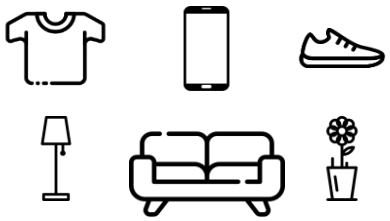
What are IT-based approaches for assisting manufacturers with the provision of product data to online retailers?

What approaches for the assisted provision of product data provide the greatest benefit for the user?

State of the Art

Providing product data to online retailers requires a lot of manual work

Suppliers / Brands



Retail Partners

Interviews with Suppliers / Brands

- 6 Semi-structured expert interview
- Key-Account Manager for online retailers / Head of IT

- Majority of large online retailers require suppliers to fill Excel-templates with product data
- Filling these templates requires a lot of manual work

State of the Art

Example of Excel-template

Artikelliste Bayerische Möbel Werke (BMW)

	Allgemeine Daten				
Artikeln	EAN	Funktionen	Material	Material Tischplatte	Weit
1983	3874964790621	Vitrine1-trg. 1 Glas-/1 Holztür / 1 Schublade	Holz: Eiche		Sch
1984	2427995708038	Kommode mit 3 Türen / 3 Schubladen	Holz: Eiche		
1985	2016728617374	Lowboard mit 2 Türen / 2 Schubladen	Holz: Eiche		Sof
1986	7020295225325	Kommode mit 2 Türen, 1 Einlegeboden	Holz: Eiche		Sof
1987	4572747247186	Highboard 1 Glas- / 1 Holztür / 2 Schublade	Holz: Eiche		Sch

Suppliers / Brands

Add line | Del line | Copy line | Check Form (press this button)

Lieferanten GLN/ILN	Artikelnummer	Artikelname	Holzart	Material Detail
2139908313832	1988	RAUM Couchtisch 73x73 Beine 6x6	Eiche	Holz: Eiche
2139908313832	1983	HUB Vitrine1-trg. 1 Glas-/1 Holztür / 1 Schublade	Eiche	z: Eiche
2139908313832	1984	HUB Kommode mit 3 Türen / 3 Schubladen		z: Eiche
2139908313832	1985	HUB Lowboard mit 2 Türen / 2 Schubladen		z: Eiche
2139908313832	1986	RAUM Kommode mit 2 Türen	Eiche	Holz: Eiche
2139908313832	1987	RAUM Highboard 1 Glas-/ 1 Holztür / 2 Schubladen	Eiche	Holz: Eiche

Eiche
Erle
Esche
Eukalyptus
Fichte
Gummibaum
Kastanie
Kauri

Retail Partners

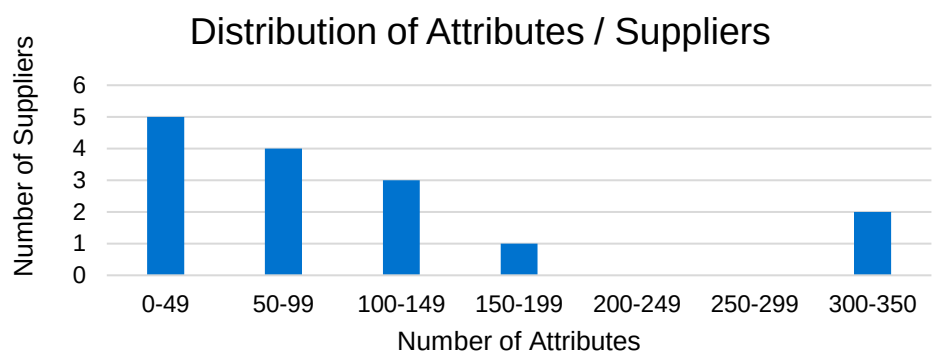
State of the Art

Analysis of Excel-files

Suppliers / Brands

Analysis based on product data of 15 micro to medium sized* suppliers of accessories, lighting and furniture)

Varying granularity of maintained data



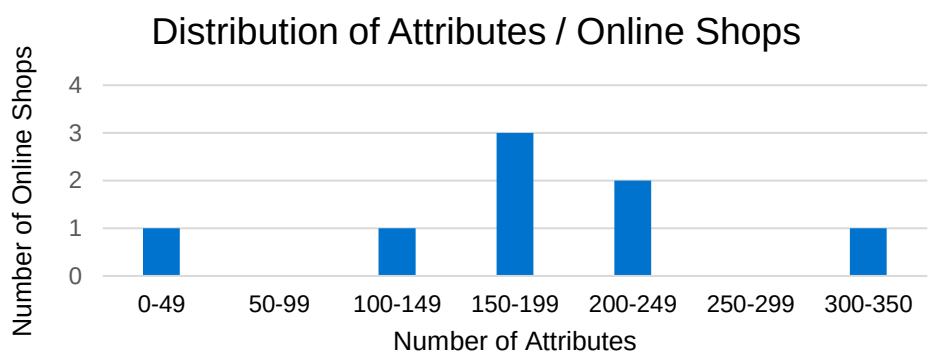
Free-Text fields contain multiple information

```
Dimensions: H: 5cm, W: 5cm, L: 20cm
Material: Glass, Plastic
```

Online Shop Templates

Analysis based on 8 templates (4 among top 10 revenue leaders)

Varying granularity of required data



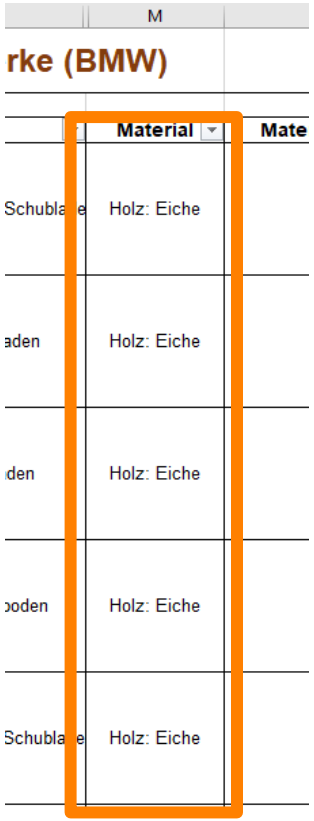
Syntactic differences
e.g., horizontal vs. vertically oriented files

Semantic differences
e.g., naming of colors: red vs. light red

* < 50 Mio€ revenue p.a., < 249 employees, based on classification by implisense.com (https://blog.implisense.com/neue-einstufung-fuer-unternehmensgroessen-im-implisense-datenbestand/)

State of the Art

Converting formats using meta-level transformations

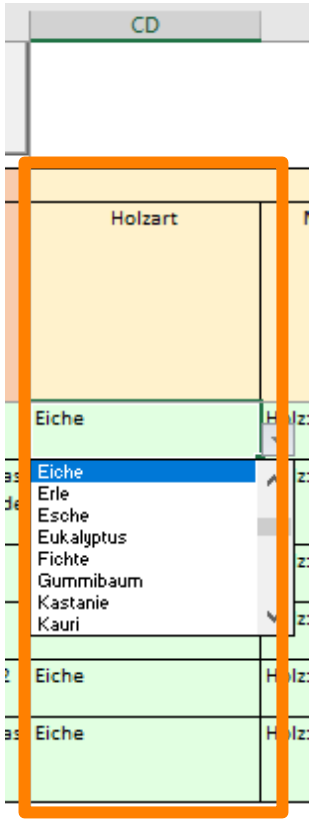


Column M → Column CD

Mapper

Holz: Eiche → Eiche

Holz: Ahorn → Ahorn



State of the Art

Converting formats using meta-level transformations

Column M → Column CD

Mapper

Holz: Eiche → Eiche

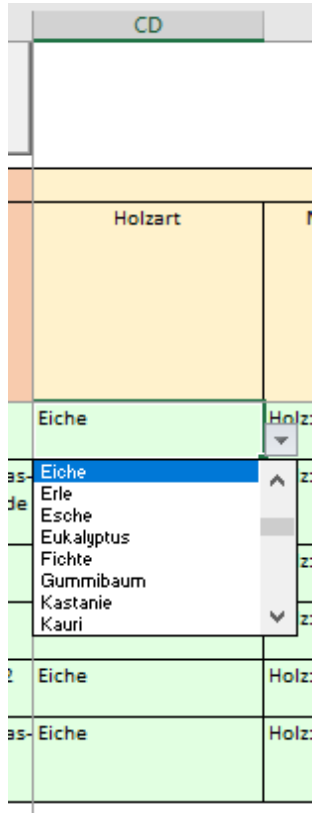
Holz: Ahorn → Ahorn

Column H → Column DF

Mapper

Dark Red → Red

Light Red → Red



State of the Art

Converting formats using meta-level transformations

Column M → Column CD

Mapper

Holz: Eiche → Eiche

Holz: Ahorn → Ahorn

Column H → Column DF

Mapper

Dark Red → Red

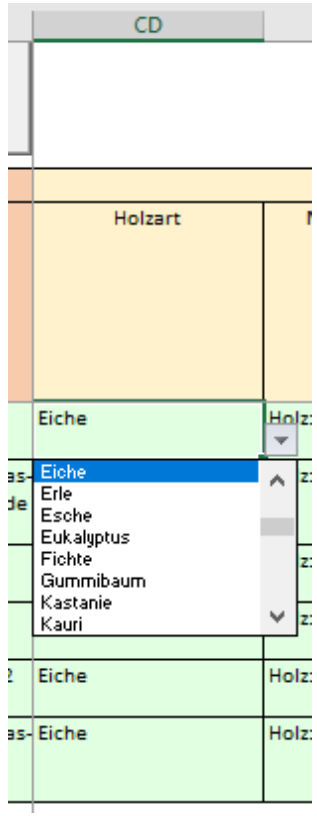
Light Red → Red

Column D → Column J

Regex

1 Door → 1

3 Drawer, 2 Doors → 2



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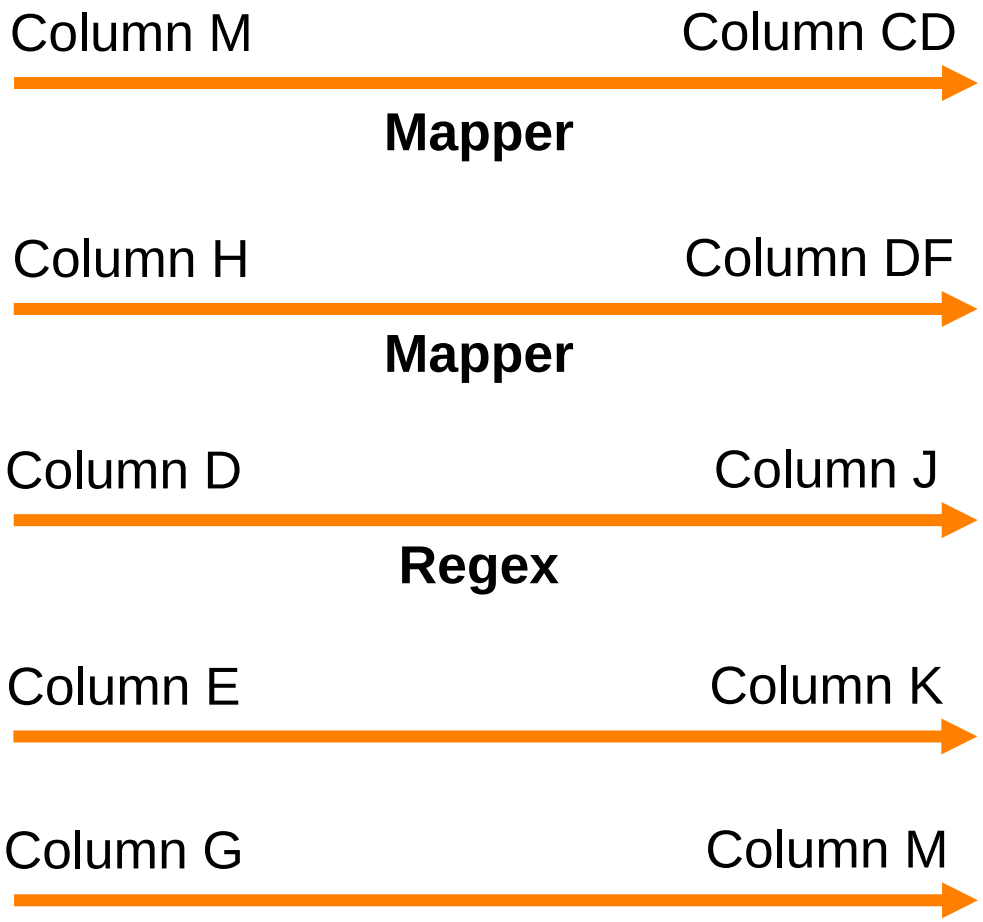
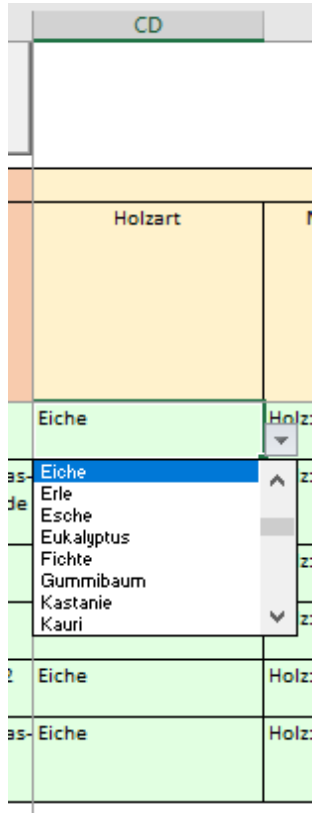


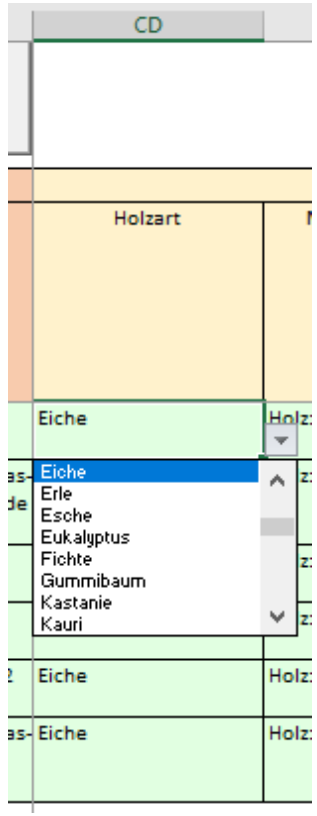


State of the Art

Converting formats using meta-level transformations

Column M
Column CD
Mapper
Column H
Column DF
Mapper
Column J
Regex
Column E
Column K
Column G
Column M

Set of Transformations



State of the Art

Analysis of required transformations

Analysis

Creation of set of transformations for 16 pairs of suppliers and online shops

Including:
7 suppliers and 7 online shops

11 Types of Complex Transformations were identified

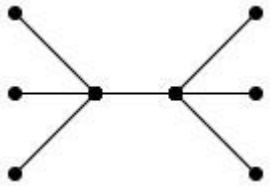
Mapper
(ca. 59% of complex transformations)
Replace a given value with its correspondence in a map
(Dark Red → Red, Light Red → Red)

Regex
(ca. 5% of complex transformations)
Extract values from string
(1 Door → 1)

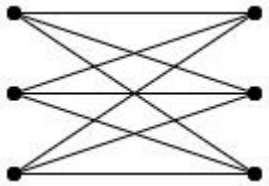
Calculator
(ca. 1% of complex transformations)
Calculate formula given as string
(Weight Package 1 + Weight Package 2 ⟶ Product Weight)

Approaches towards Product Data Exchange

Standards

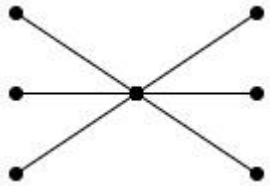


Direct Transformations using Ontology Mapping



M x N

Indirect Transformations using Mediator Ontology



M + N

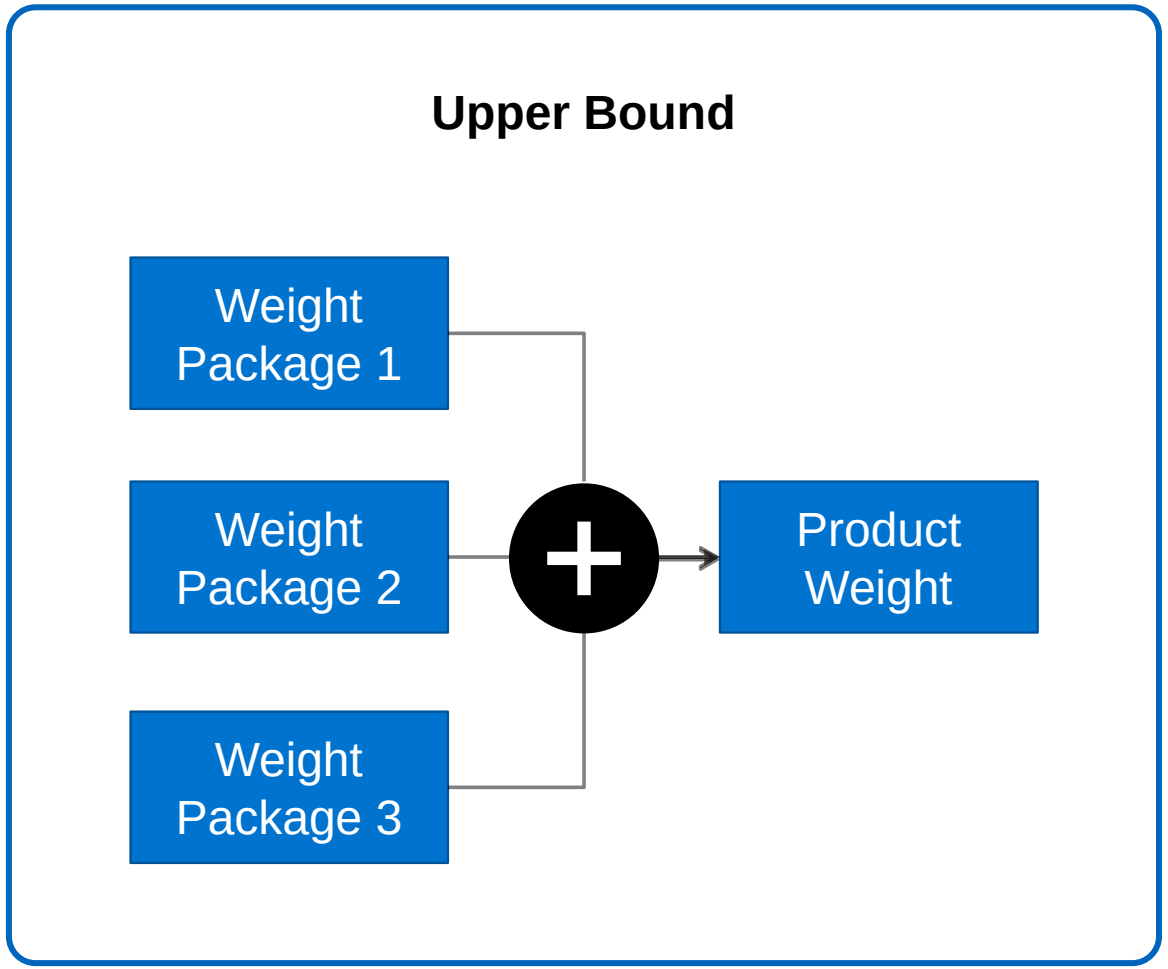
Require consensus
(Not established in Home & Living industry)

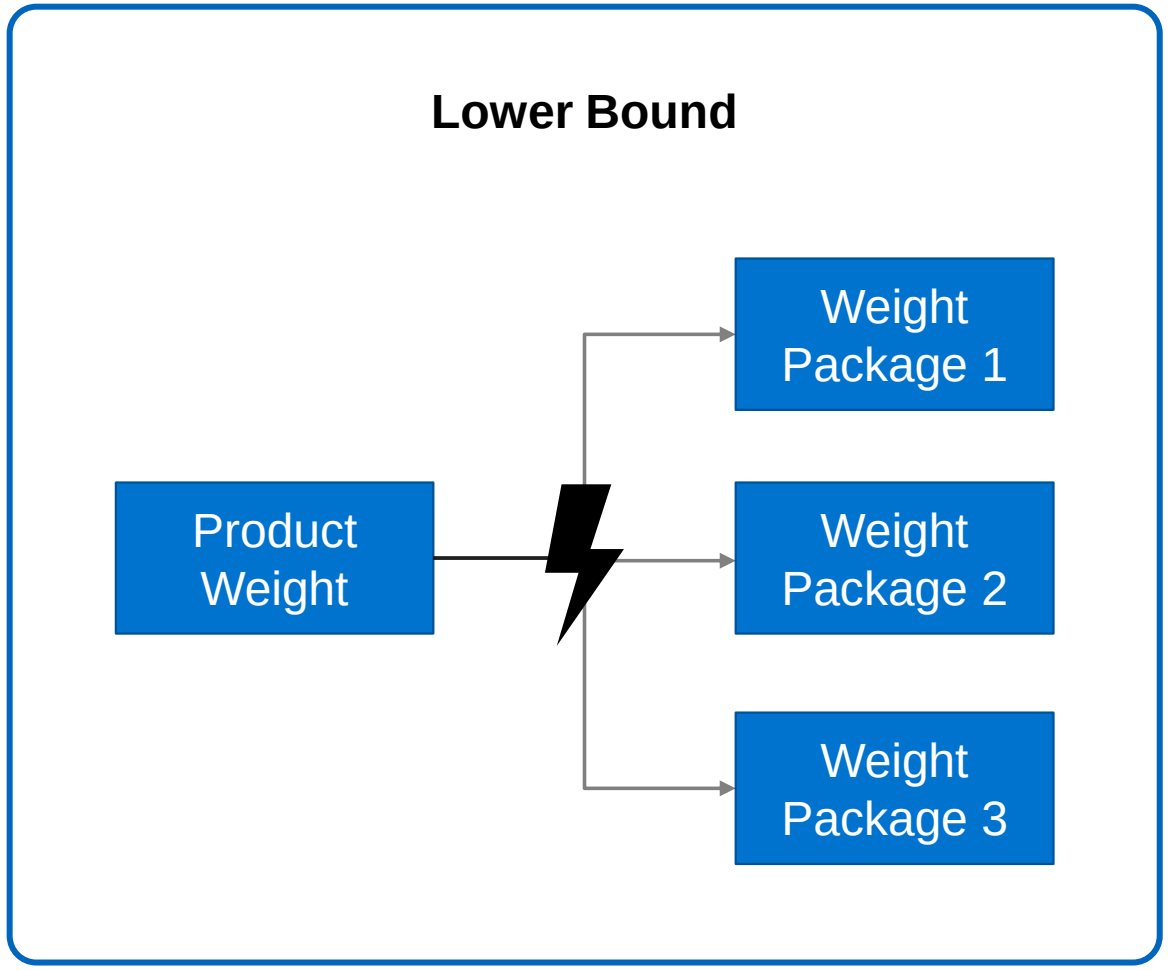
Require ontology
(formal, explicit specification of shared conceptualization)

Commonly introduce **lower and upper bound on granularity**

Approaches towards Product Data Exchange

Mediator ontologies commonly introduce an upper and lower bound for integration





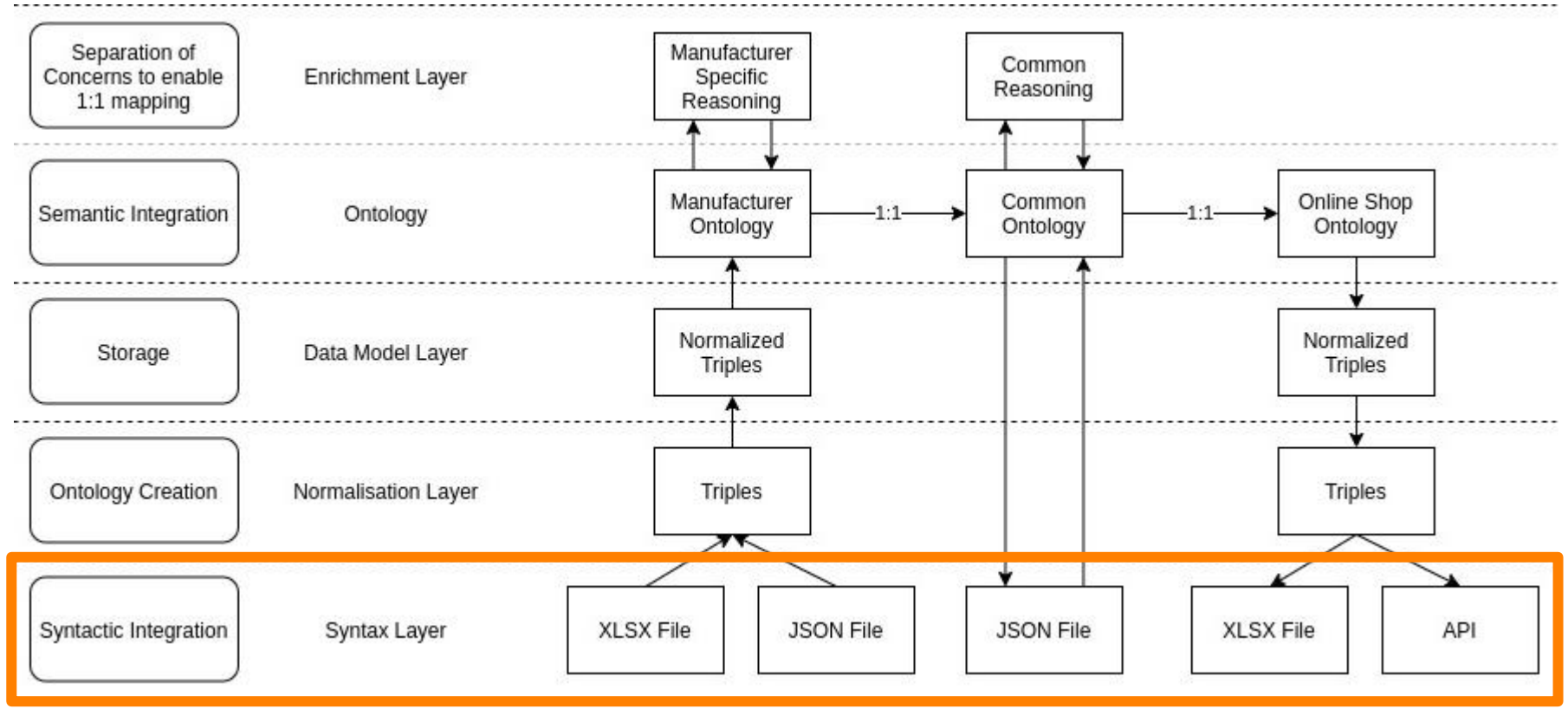
Proof-of-Concept for IT-Assisted Provision of Product Data

Design Principles

Metamodel-Based

Separation of Concerns

Architecture



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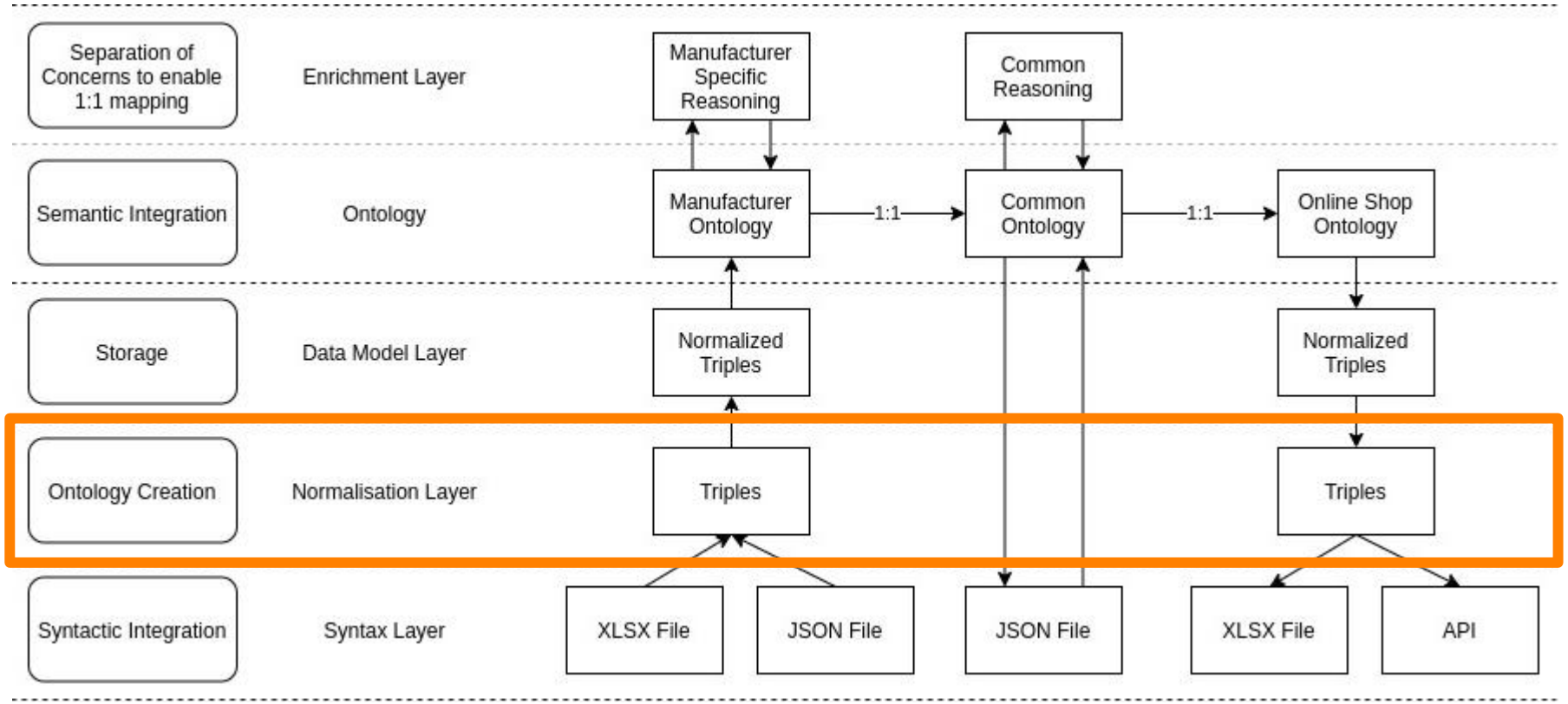


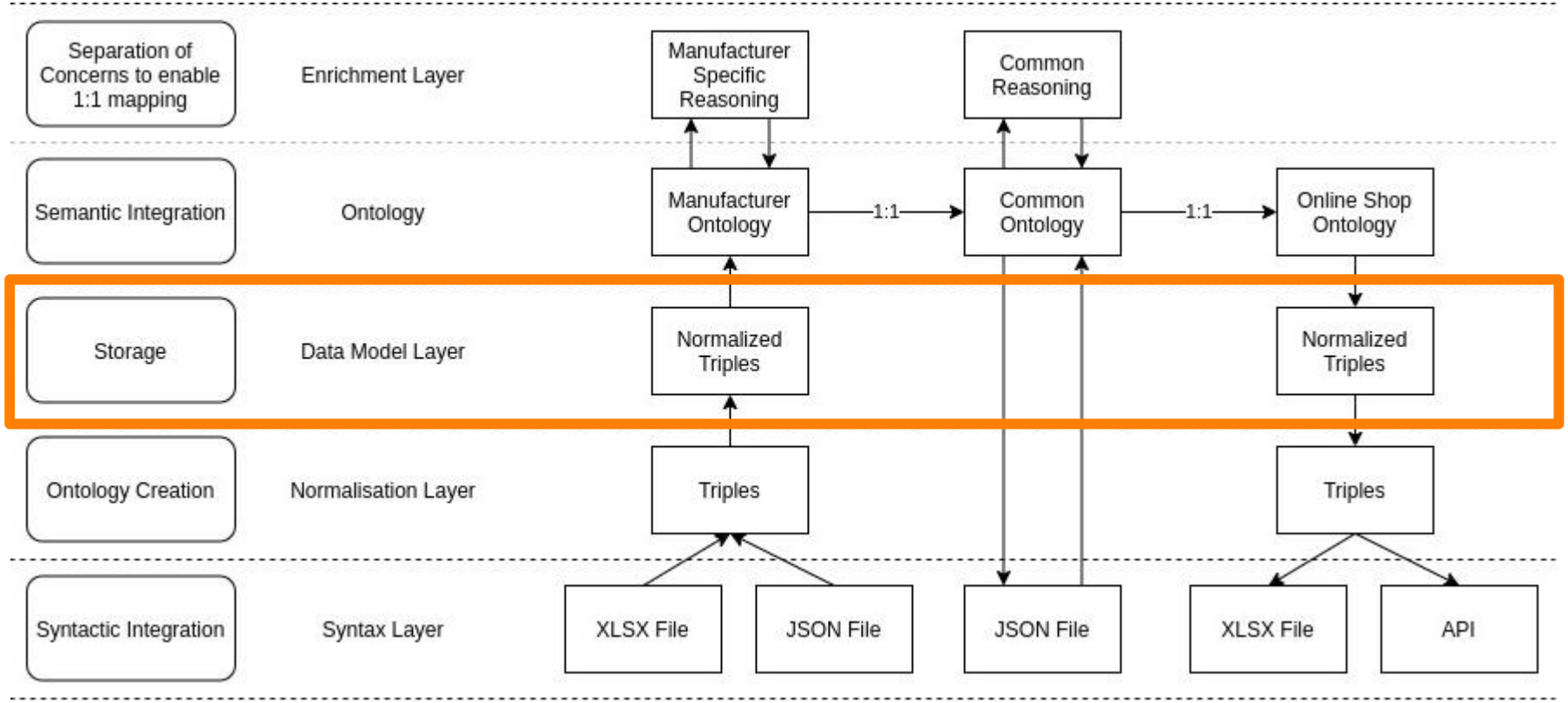
Proof-of-Concept for IT-Assisted Provision of Product Data

Design Principles

Metamodel-Based

Separation of Concerns

Architecture

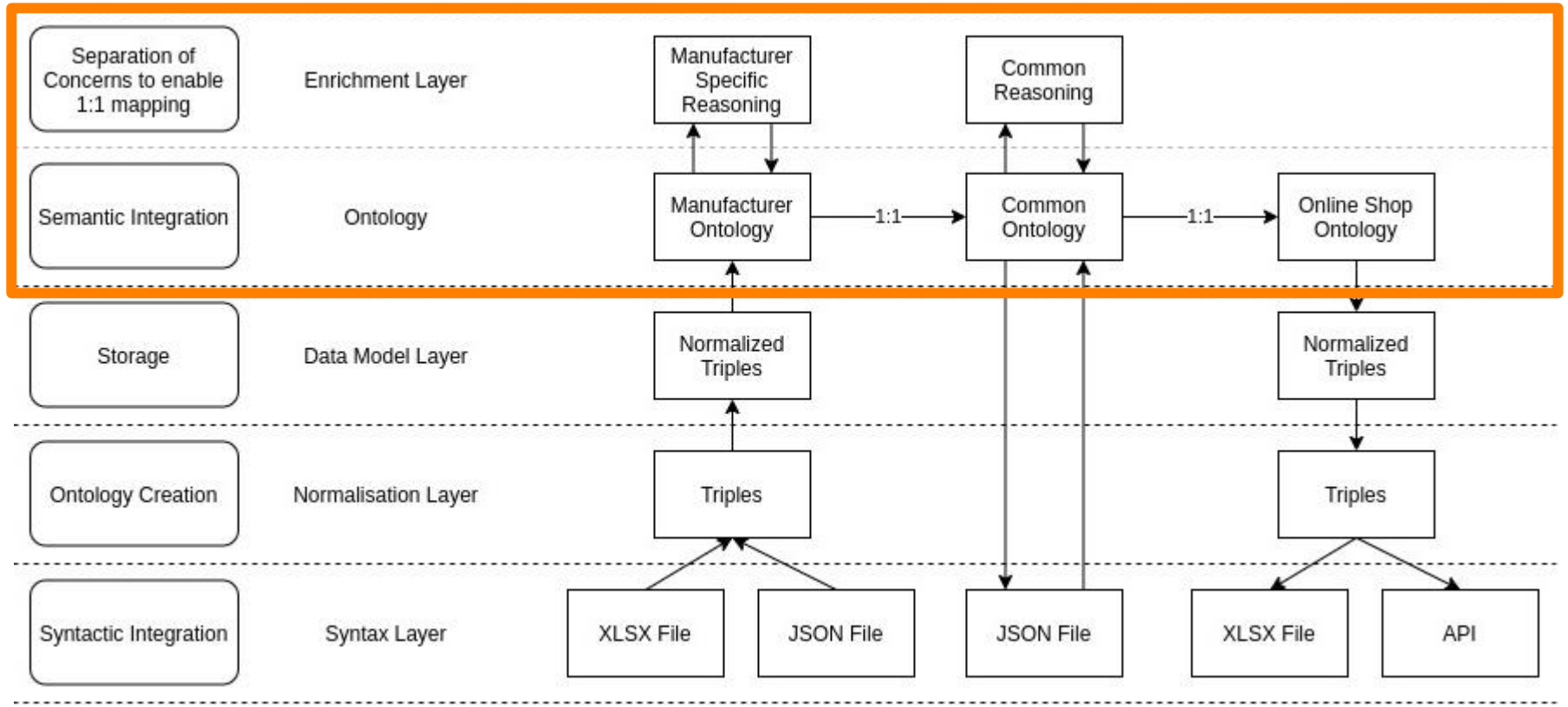


Proof-of-Concept for IT-Assisted Provision of Product Data

Design Principles

- Metamodel-Based
- Separation of Concerns
- Ontology incl. Reasoning

Architecture

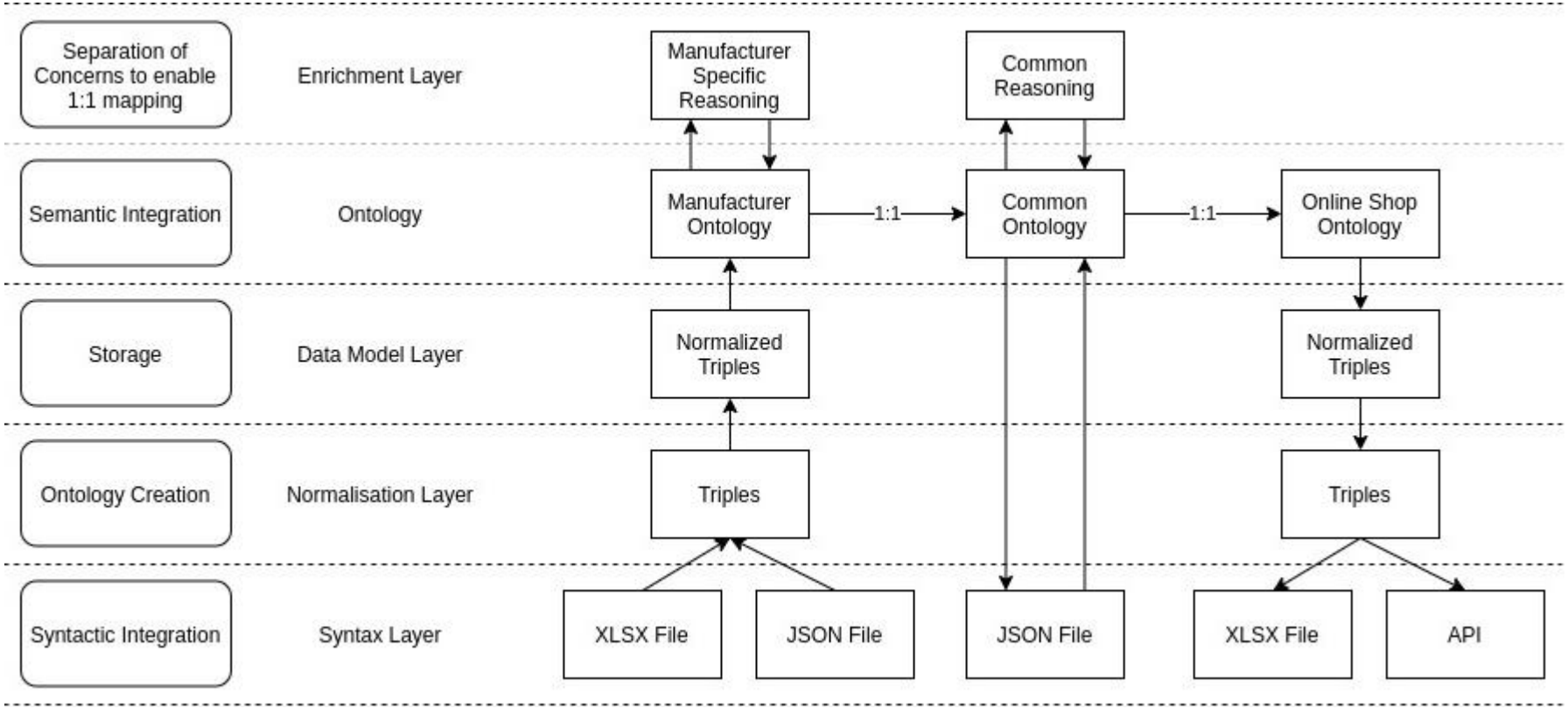


Proof-of-Concept for IT-Assisted Provision of Product Data

Design Principles

- Metamodel-Based
- Separation of Concerns
- Ontology incl. Reasoning
- Mediator

Architecture



Evaluation of Proof-of-Concept

Quantitative Evaluation

Based on filling the templates of 3 online shops with the data of 3 suppliers for 20 products with 5 attributes

Approach	Manual Steps Required
Manual	900 [1)]
Direct	45 [2)] + 3 complex transformations
Indirect	30 [3)] + 1 complex transformation

Based on previous analysis of required transformations

Implementation of PoC can transform ca. 94% of values using the 5 most used complex transformations

Qualitative Evaluation

Based on 6 semi-structured expert interviews

- Most interview partners would be happy to use it and expect great time savings (~0,1 FTE – 1 FTE)
- Compatibility with existing template of online shops is important
- Limitation on already existing data
- Further extension to media files and order & inventory data would be interesting

1) 3 online shops x 3 suppliers x 5 attributes x 20 products 2) 3 online shops x 3 suppliers x 5 attributes 3) (3 online shops + 3 suppliers) x 5 attributes

Conclusion, Limitations & Future Work

Conclusion

- Product data in the Home & Living industry is provided using Excel-files
- Approaches using common ontologies as well as separation of concerns are most promising

Limitations

- Restriction to Home & Living industry
- Focus on product data
- Focus on distributing already existing data

Future Work

- Application of ontology mapping to automate 1:1 mappings between ontologies
- Publication of mediator ontology & mappings for common online retailers for application in practice

B. Sc.

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